

Discussion on "HOMs in Spokes - Are They a Problem?" by Terry Grimm

Grimm explained that the explicit β -variation has not been taken into account in their evaluation of the HOM mode Q-values, the worst case has been selected instead.

Shepard shared their experience that small ports to remove HOM-power from the cavity are not a problem for these resonators. There is no need to locate them on the very small beam pipes that have a very high cut-off frequency, as Grimm had suggested. There is a further advantage of locating the HOM ports (if needed) onto the cavity body. Both, electric and magnetic fields will couple to simple coaxial antennas and trapped modes should be less of an issue.

On the question of the agreement between simulations and measurements Grimm presented data for a RIA $\beta=0.47$ elliptical cavity. HOM frequencies agreed within less than 1%, Q-values agreed within 20%, which is reasonable. He confirmed that the measurements were done using an antenna that was a reasonable mock-up of the actual power coupler. The result of the simulations for RIA did not show any dangerous modes. The evaluation of the danger of the modes used the actual RIA lattice and beam structure. A reasonable spread of HOM frequencies along the accelerator has been applied.

In a next topic some simulation issues have been discussed. Delayen cautioned against drawing conclusions from simulated field-flatness data of HOMs for structures with low cell-to-cell coupling. The related external Q-values can be off by up to 3 orders of magnitude from the measured values. This is related to the fact that structures are only tuned for the fundamental accelerating mode. The effect of the tuning onto any other modes is totally arbitrary and results in unpredictable field levels for each mode at the position of the HOM coupler. This provides another advantage for spoke resonators, as for structures with strong cell-to-cell coupling the behavior of HOMs is more predictable.

The final discussion point was related the differences between the significance of HOMs for SNS and RIA. The 4K operation of spoke resonators lowers the Q_x of HOMs and thus makes them less dangerous. The cw-operation of RIA also significantly reduces the harmonics excited by the beam. This reduces the likelihood of exciting HOMs.